Yi 2
7397
F 15

16

Of Digestion 621.
Of the Chyle — 652.
Of the blood —

V I shall first remark that the
Stomach is a most important viscus,
hence it is possessed by all animals,
It is so full of nerves that it may be com-
the testa by data genera excepted. So
=pared to a tendinous expansion of the brain.
essential are its functions to life, that
it has said the soul is seated it. It is
certainly the index of the state of the
system in many diseases. It possesses
a Association in health & sympathy in sickness
wonderful connection with
every part of the body. in health as
well as sickness — The nerves and
blood vessels may even the mind are
It is one of the waste gates of ex-
affected by it. — hence it should never
=cessive impressions.
be lost sight of in investigating, & prescribing for diseases
of those parts. In many diseases it is said
enter the body thro' the medium of the

such parts of the mouth as to favour the action of the teeth upon it. It afterwards protrudes it into the fauces from whence it passes by the tonsils - Velum palati - & Oesophagus this assisted by the action of a great number of small muscles into the Oesophagus - and from thence in to the Stomach where it undergoes the process of digestion. Solids more easily digested than fluids

Of Digestion.

Question In what manner is this performed? - The answer to this Question shall be the business of our present inquiry. V

This changes which the food undergoes in the Stomach previously

stomach — still more I believe are expelled from the body which act primarily, & exclusively upon it. — ~~But to observe~~ —

It is formed ~~of~~ like the teeth upon the compound principles of carnivorous & granivorous animals.

Its function is an important one in the animal Oeconomy. ~~The chemist~~ We behold in it something like what the alchemist have sought for in their crucibles — in their attempts to obtain gold from the baser metals — a power of changing the most dissimilar & heterogeneous matters into a ~~nobler~~ substance which imparts nourishment & life to the human body. —

to its being converted into Chyle, has been ascribed to the operation of two agents. These are 1 mechanical and 2 chemical. The mechanical includes Trituration only. The chemical includes - heat - putrefaction - Solution - and fermentation. Of each of which I shall treat in Order.

much was ascribed to Trituration by the mechanical physicians. Pitcairn has computed the force of the stomach employed in digestion to be equal to 12, 951 pounds. Dr Beaumont has enumerated all the forces which are supposed to act in digestion - These are the muscular action of the stomach - the action of the Diaphragm in respiration - and

even the constant pulsation of the Aorta on the Stomach. ~~But nothing~~ can ~~[illegible]~~ ~~be more foreign~~ Dr Pitcairn's calculation of the force of the Stomach does not deserve to be contradicted, and the forces ~~of the~~ enumerated, + ~~by~~ Dr Boerhaave, ~~[illegible]~~ will appear to be very trifling from the history of the following expts made by Spalanzani. He swallowed 25 whole grapes - and discharged 18 of them ~~without~~ in an unbroken state. He swallowed many whole cherries afterwards, most of which he discharged in the same sound state in which he took them. The triturating force of the stomach must be small indeed not to

have destroyed the texture of those tender fruits. We proceed next to inquire into the chemical agents which have been supposed to be employed in digestion.

~~Some~~ I reject putrefaction altogether from having any agency in digestion. On the contrary - the putrefaction of the aliment unfits it so much for being converted into Chyle - that when aliment which partakes of a putrid nature is received into the stomach, it is always counteracted by the action of the gastric juice upon it. —

The ~~other~~ other agents which are concerned in Digestion, I suppose to be, Heat & Solution; ~~the~~ another to be mentioned hereafter.

[✓ Spalanzani has determined this by an accurate exp.t — he exposed a vessel with some flesh to a ~~[illegible]~~ heat = to y.e of y.e human body — & the same Quantity to a heat of the common air which was probably 20.t degrees below it — The first putrefied in 12 hours — the last — in 2 or 3 days.] —

✓ Mr Hunter found that the digestion of a frog which went on at ~~65~~ 60.t was effectually checked ~~[illegible]~~ when it fell to 35.t or 40.t: ~~[illegible]~~ It is from the influence of heat in part that digestion goes forward more rapidly in warm blooded, than cold do animals. Eg Dog - & viper

Heat is essential to digestion. The polypus employs 2 or 3 days in ~~Winter in~~ Digesting that food which it digests in 12 hours in summer. ~~[illegible]~~ no solution can take place without it. The gastric Juice which is the principal Solvent of the aliment in the Stomach discovers no more dissolving power in a heat of 44° or even 48° than common water. It is more active in a heat of 79°: but its dissolving power is greatest at 112°.

Heat is likewise essential to fermentation, and no degree is more favourable to an active and perfect fermentation than the heat of the human body.

& The dissolving power of the saliva has 12℥
been established by ~~[illegible]~~ many experiments. ℥xiv
~~[illegible]~~ of it are secreted in the course of
24 hours. It serves the further purpose it is
supposed of absorbing ~~oxygen~~ which
it conveys into the body. It has
neither taste, nor smell, and hence
~~[illegible]~~ it never impairs in its healthy
state either ~~[illegible]~~ of the senses of taste or
smell.

Solution is likewise essential to di-
-gestion. The liquors which dissolve the
food, are the Saliva, & the Gastric Juice.
~~To decide the dispute between Dr. Mc Bride & Sir John Pringle, one of whom asserts that it promotes the other checks it~~ The Gastric Juice is the
most active of these liquors. It was not
the honor of Spalanzani to have discovered
that the Gastric Juice possessed a strong
dissolving power over animal & vegeta-
-table Substances by his experiments.
The same doctrine was established by
Dr Haller many ~~[illegible]~~ years before the time of Spalan-
-zani. This Gas-
-tric Juice acts more or less in all
animals, but more in some of

them than others. — Those Animals which have gizards stand in the least need of it — for they divide the food in such a powerful manner that it afterwards requires but little solution in the Stomach. Its dissolving power is very great in the human stomach — here we find cartilages — tendons & even bones are dissolved by it as well as common flesh. — It is probably more abundant and more active in Children & in old people than in middle age, in order to supply the defect of mastication from the want of teeth. It acts most speedily upon food that I have said all is well masticated, and upon flesh

V the presence of nervous influence is indispensably necessary to digestion. By cutting, or tying the 8th pair of nerves, digestion was destroyed in a wolf & a dog, insomuch that the contents of the stomach Dr Wall says become putrid soon afterwards.

which is perfectly done or well cooked. This has fully demonstrated by the exp: of Dr Stevens of St Croix in his thesis on digestion. —

This gastric Juice has been said by Jno Hunter to dissolve the Stomach after death. — It is possible this is sometimes the case but I am disposed to ascribe what he calls a corosion of the stomach by this liquid to a destruction of substance from inflam[n] & mortification in some instances. Such appearances are very common after death in all the bowels, where we are sure the gastric Juice can exert no corroding power.

Spadanzani says he found digestion to go forward after death, but in a very feeble degree after the heat

v notice of this aid.

n In addition to these powers, in promoting
digestion, the influence of the whole
system is necessary for this
purpose - hence we find it impaired,
by depressing passions of the mind, not only
by all those
accidents, and diseases, which divert
the nervous influence from it. In short
It is exclusively an animal process as
much so as the formation of blood & semen,
& never has & perhaps never can be
imitated out of the body. -

go to p: 644 +

+ I beg this fact to be remember. abstinence a
low diet, age founded on it. when we wish for the aid of
all the powers of life, in curing a disease, let us not
give them nothing to do in digesting a quantity of food, or
food difficult of digestion. Thus cause
Grammar.

of the dead animal was dissipated. —

The gastric Juice yields by a chemical analysis a large proportion of the animal Ammoniacal Salt — in which is contained the phosphoric or animal acid. Take

The Stomach ~~[illegible]~~ possess a power of curdling milk, ~~This is evident by~~ ~~But~~ ~~[illegible]~~ the stomachs of many young animals, particularly children, Calves — Turkies & fowls. But this power resides in other animal substances as the ~~[illegible]~~ heart of a turkey. It also resides in fish, ~~[illegible]~~

~~nay [illegible] it resides in the [illegible] of the [illegible]. I [illegible] these facts~~

~~only to [illegible] myself~~

~~the list [illegible] of [illegible] [illegible]~~

~~[illegible] to reside in the~~

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juice, or that fermentation was in a degree promoted by it. —

The aliment being thus prepared by solution, undergoes a third change in the Stomach by means of Fermentation. I know this process in Digestion to be rejected from the modern Systems of Physiology — I know too that there is as much a fashion in Opinions as there is in Dress. I shall however still defend fermentation as one of the causes of digestion, not because I have like Gil Blas written a book upon it, but because I cannot account for all the phaenomena of digestion without it. Such of you Gent: who know

how many opinions ~~which I have~~ which I once believed and taught - I have rejected in the course of the last ~~10~~ 10 or 15 years will not accuse me of obstinacy upon this Subject. — My weakness in the republic of medicine is of a very ~~the~~ opposite nature. ~~I am accused of a~~ It consists in a disposition to change ~~too easily~~ my opinions. If this ~~disposition~~ be a disorder in my mind, I ~~do~~ hope no remedy will ever be discovered to remove it - for ~~I do~~ I conceive that to be willing ever to unlearn, ~~instead of learning~~ is the most certain & effectual way to come to a knowledge of the truth. —

[By fermentation I mean that natural process by which heterogeneous ~~many~~

matters are rendered so homogeneous, as that a new product is obtained, wholly different from the original mass from which it was formed. —

Animal & vegetable — & even fossil substances are all capable of fermentation. — It is specifically different in each of those classes of matter. ~~In~~ when vegetable matters, undergo the ~~process~~ process of fermentation, they ~~passes~~ pass thro' three stages — viz ~~the~~ a vinous ~~the~~ an acetous & a putrefactive state. It is uncertain whether animal matters pass thro' the vinous, — tho' some facts make it probable, — but it is certain that they undergo the acetous ~~state~~ and putrefactive states. Dr Haller assures us

that he had distinctly perceived an acid smell in meat, and Dr Thomas Smith of Birmingham informed me that he distinctly perceived not only an acid smell but an acid taste in a piece of beef which he had kept two days in summer. —

Four circumstances are necessary to favour the fermentation I have described.

1 Heat from 72° to 112° are most favourable to it.

2 moisture: Sugar tho' it afford the basis of fermentation in all vegetables, yet may be kept in a sound state for an 100 years provided it be kept free from moisture. — 3 Air.

4 Rest — This is necessary to render all the stages of fermentation regular. Motion when moderate either prevents it altogether

or hurries it on suddenly to the putrefactive stages. —

The fermentation of all Substances matter capable of it is quickened by certain ~~Sub=~~ called ferments.

Let us now inquire how far these principles apply to the digestion of our food.

1 Our aliment consists of such Sub=stances as undergo the various putrefactive stages of fermentation out of the body. —

2 The heat of the Stomach is highly favourable to the fermentation of the aliment when received into the Stomach. (3) our aliment & saliva are both strongly impregd. wh air.

4 The aliment disposes from saliva=

and digestion is favoured by it.

✓ Dr Harwood of Cambridge proved the Advantages of rest after eating by the following experiment. He gave two pointers a hearty meal of flesh. One rested - the Other ran two hours After eating. In the former all the food was digested - in the Other - it was scarcely began.

The state of the Air influences digestion. The inhabitants of ~~the mountains~~ of Swizer=land digest ~~the grossest~~ Aliments &c ~~which are so viscid and gross that~~ upon their mountains which they can=not digest ~~them~~ upon their plains. returns ~~go on~~ to p 648 ✓

-gastric juice - and the liquids ~~we~~ take with our meals, ~~sufficient all~~ that degree of moisture which is amply suffici-:ent to promote its fermentation.

5 Digestion is always best promoted by moderate rest. - motion, when greater than the ~~action~~ exercise of walking impairs it if used immed: after eating a hearty meal. → V

But it may be said that the rapidity with which digestion is conducted in the Stomach is too great for the slow process of fermentation - tho' favoured by all the circumstances which have been mentioned. I should ~~say~~ concur in this objection ~~did~~ did I not observe two things which are calculated to accelerate it beyond its ordinary term of duration out of the body. These are 1^{st} 12

speedy & perfect Solution in the stomach
by means of the gastric juice - now,
heterogeneous liquids, ferment much
sooner than heterogeneous matters of a
more solid nature. — ~~But~~ 2dly the
~~action of the~~ saliva acts upon the food ~~pass~~ as
~~another~~ a ferment and thus promotes
its fermentation. That the saliva is
a very essential ~~digestion~~ liquor
~~promotes fermentation~~ in the process
of digestion I infer from the quantity secreted ℥xii in a day 24hr. the waste of it
being so generally attended with indigesti=
=on. This is evident in great smokers
& chewers of tobacco — some years ago
a certain kind of Gum was used as a
masticatory by the nobility of Spain to
perfume their breath. It ~~was~~ produced
this effect, but it spread Dyspepsia,

& Hypocondriasis among them. But I go
the Saliva
further, and add, that ~~it~~ acts as a fer-
=ment upon the aliment in promoting
digestion. This I infer not only from
the experiments of D^r Stahl, - Boerhaave -
Hoffman - & M^c Bride, - but from the
following experiment made by my-
=self. I took two pounds of mutton
& bread - consisting of ℥ij each & put them
into seperate Vials. To one of them
healthy
I added ℥ss of Saliva - to the other half
exposed
an Ounce of water. I then ~~placed~~ each
of them to the same degree of heat in
a box of sand in which I placed a
thermometer so as to keep the heat
as nearly as possible at the tempera-
-ture of the human body. In five

hours the mixture with the saliva began to ferment, - in seven it became sour & in twelve it became putrid, - while the mixture with the simple water remained unchanged for 20 hours.

I repeated this experiment a 2nd time - and with exactly the same result.

Thus far Gent: have I mentioned presumptive arguments only in favor of fermentation being essential to digestion. But I shall not leave the controversy here. To decide it beyond all possibility of contradiction, I tried the following experiments - not upon Hawks - Cows Eagles - dogs - cows - horses For even upon Dr Stevens Human boarders, but

upon the ~~aliment~~ contents of my own stomach, at a time when I enjoyed the most perfect health.

Expr. 1

Having first taken a few grains of Salt of ♃ in order to destroy any remains of an acid in my ~~Having dined upon Beef - bread - pease~~ stomach after my last meal, I ~~& small malt beer - three ho~~ dined upon Beef - bread - pease & small beer. Three hours afterwards I took two grains of Tart: Emet: & threw up the contents of my stomach. They were acid to the taste, & imparted a red color to an infusion of a blue flower.

Expr: 2

Having taken salt of ♃ as before, I Dined on veal - bread & pease, & drank water only with them. Three hours

Afterwards I vomited. The contents of my Stomach were sour, & produced the same red Color upon being mixed with a blue vegetable infusion.

Exp^r 3.

Having dined on poultry - Cabbage - and unleavened bread, I took a Vomit ~~three~~ at the usual hour afterwards. The event was exactly the same as in the two preceding experiments

Exp^r 4.

Lest it should be supposed that my Sto=
=mach ~~[illegible]~~ was disordered - or possessed an acid idiosyncrasy - I prevailed upon one of the most healthy ~~& [illegible]~~ young Englishman in the University of Edin^r, D^r Penny in the year 1767 to lend me

the aid of his stomach in pursuing my inquiries into this subject. He dined ~~with me~~ on duck - beans - & drank small table beer with them. Three hours afterwards he vomited. The ~~urine~~ liquor he discharged was sour - & imparted a red colour to the blue vegetable infusion.

These experiments were ~~made~~ frequently & repeated, ~~& also~~ sometimes varied - but always with the same issue. —

I know that great pains have been taken to discredit them by a report that I was not in health when ~~I made~~ them. but this is begging the question. Wepfer - a German Physician who has lately written on digestion admits my ~~experiments~~ being in health, but ascribes the

Acid liquor which I discharged to the acid of Tartar Emettic being separated from the Antimony in my stomach. — This assertion is too absurd to be contradicted. —

I concur with Spalanzani in all he says in favor of the wonderful dissolving power of the gastric Juice — but solution alone will not change the Nature of Aliment, or produce any new compound — much less will can it produce the same liquor from all the different kinds of Aliment which are taken in the Stomach. Is there a menstruum in Chemistry, that produces exactly the same compound when mixed with different salts — & earths —

I ask the question again - is there any analogy to the Gastric Juice in all nature - if we allow it to possess not only a dissolving - but an assimilating power - over the most heterogeneous substances with which it is obliged to unite in the stomach. I answer there is not. - I beg pardon Gent: for this challenge — I now recant — but one - and but one analogy to it - It is found, not in the book of nature, but in ancient fable - it is the hand of midas which turned every thing it touched into Gold - It differed only in performing this change more suddenly, than the Gastric Juice converts ailment into Chyle. —

I think it probable that the

√ I conceive this Acid to be formed necessarily, and to serve very im=portant purposes in the Animal Oeconomy. —

+ In explaining ~~To explain~~ particular functions it is necessary to keep any eye upon all processes w:ch go forward ~~whole~~ in every part of the body, the ~~functions of the body~~ — Otherwise we shall make as great mistakes as Physi=ologists, as those Physicians make who prescribe for Symptoms only in a disease without regarding the State of the whole system.

digestion in a healthy State always
ceases as soon as an acid is evolved
from the Aliment. The acid which
we find in the animal Salts, and
which afterwards becomes a basis of phos-
-phorus - appears to be formed from it.
It is the absence of this acid probably
which produces the foetor, & its predo-
-minance which forms the nucleus
of the stone. It exists in a material
only - and not in a formal State
after it leaves the stomach, - for it is
covered, after it is changed into Chyle
so as not to be discovered by
the common tests of acids. ft

Thus have I delivered my opinion
upon the subject of digestion - now shall
I yield it to Spalanzani - Stevens -

In detailing the facts & exp^ts in favor of fermentation taking place in the stomach, I have not availed myself of the least gas, from the air & acid humors which are often discharged from the stomach in digestion - for I consider them ~~when~~ morbid phaenomena, to be explained hereafter, ~~when this~~ depending upon a relaxation of the stomach, and an excess in the fermentative process.

or Gosse ~~&c~~ Untill they have taken
as many pains as I have done, to
establish the hypothesis they have
given to the world.

V There is but one Exp[t] wanting
to ~~establish~~ establish my theory - viz to ex=
=amine by distillation whether the Con=
=tents of the Stomach will yield by distil=
=lation a Vinous Spirit. — If they should,
it would give fermentation in the
Stomach as one of the causes of digestion be=
=yond all possibility of being doubted.

~~4~~ I shall now add a few Observations
upon the phaenomena which go for=
=ward in digestion. —

There is after every full meal
a slight fever. It is sometimes ushered

Dr Prawl's Expts: which render experimentn: highly probable. He died in 1802 with yellow fever before he had completed his Expts:

A Dog was killed his body opened and a thread tied round the Duodenum just below the pylorus, the duodenum and Asophigus were then cut off & the stomach immediately taken out & nearly all the gastric juice poured out, it was then filled with Dough made of wheat flour & water & covered over in warm sand, & in which Farenheits Thermometer stood at 96° with the divided end of the Asophigus just above the surface of the sand, in this situation any Change which might take place in the Dough would be easily observed, a piece of Dough was moistened with water & covered in the sand by the side of the stomach, by way of comparison — in two hours & three quarters a very active fermentation was observed in the stomach — the Dough worked up & run out of the Asophigus — no chang in the Dough in the sand

Experiment 2d

A Cat was next killed & the stomach taken out as quick as possible to prevent it from cooking — the thread & other precautions to save the gastric juice was neglected — & the stomach immediately covered in the sand — & a lump of Dough about the size of a walnut put in the stomach & the same quantity put in a vial containing a small quantity of water — in one hour & twenty minutes there was a considerable motion in the stomach & the Dough worked up three fourths of an inch above the end of the Asophigus — no change in the Dough in the phial —

Experiment 3d

Another Cat was killed & the stomach taken out this stomach contained a large ~~quantity~~ table spoonfull of the gastric juice about ~~two~~ thirds of which was poured out into a phial — equal parts of Dough was put into the stomach & phial — the phial was used by way of Comparison — in one hour & twenty five minutes the Dough in the stomach shew signs of fermentation the working increased & in 4 hours the fermentation was so considerable as to force 2/3 of the Dough out of the stomach — it was compared by a bystander to the working of a barrel of Cyder — the motion continued untill 6 hours at which time the sand was suffered to cool — not the least signs of Change or motion appeared in the Dough in the phial

in with a slight degree of chilliness,
and in weakly people it is often termi-
-nated with a gentle sweat. This fever
is occasioned by the stimulus of the
meal being overproportioned to the
excitability of the system produced by
hunger. — It is not unfrequently con-
-nected with eating — nor is it perce-
-ived after a slender meal. The know-
-ledge however of the existence of this
fever may be applied to several useful
purposes. — It should lead us to recom-
-mend a plentiful meal to all persons
who are about to be exposed to the
cold in a situation in which they
cannot use much exercise In a small

For the time is not yet come when
philosophy can aid either war, or
government.

pamphlet which I published during my attendance on the Military hospitals ~~for~~ entitled "Directions for the preserving the health of soldiers" I recommended in ~~strong~~ terms that a soldier should never do the duty of a Centinel in cold weather, but after a hearty meal. ~~but I am sorry to say that this advice~~

2 There is frequently a disposition to Sleep after a full Meal. This is owing to the stimulus of the food producing fulness &

dyspepsia in the brain tending to coma, or the ~~Palsy~~ ~~Apoplexy~~ ~~Epilepsy~~ ~~Insanity~~ ~~Idiocy~~ ~~Hypochondriasis~~ ~~Hysteria~~ ~~Melancholy~~ ~~Madness~~ ~~Fatuity~~ ~~Stupidity~~ ~~Dullness~~ ~~Drowsiness~~ ~~Lethargy~~ ~~Coma~~ ~~Apoplexy~~ ~~Pals

This sleepiness is not necessarily connected with eating. It never succeeds a moderate meal. Lewis Cornaro tells us that after he adopted the new & temperate mode of living which restored his health, & prolonged his life to the most extreme old age, he found no disposition to sleep after eating.

3 The mental faculties are generally affected by a full meal. But this likewise does not follow a temperate repast. Lewis Cornaro was used to exchange his knife & fork for a book, or his pen & ink, & never found any inconvenience from it after he began to live a life conformable

6

V. The food generally lies from 1 to 7 hours in the stomach according as it is more or less easy of digestion. Its medium time is from 3 to 5 hours according as it is animal or vegetable. I shall hereafter mention instances of substances lying days - weeks - months & even years in the stomach without being digested. p. 649 =

to reason & nature. —

4 There is generally a disposition to rest after a plentiful meal, [illegible]

Dr Hammond of Cambridge proved the advantages of rest in promoting digestion by the following experiment. He gave two pointers a hearty meal of flesh. One rested; the other ran two hours after eating. He then killed them both. In the former all the food was digested; in the latter it was scarcely begun.

5 The state of the air influences digestion. The inhabitants of Switzerland digest aliments upon their mountains which they cannot digest in their valleys, nor upon their plains. V

[illegible] presence for a chronic

disease, without enjoining my patients to make six or seven small meals, instead of two or three large ones in a day. There are many instances of apoplexies & palsies & some of sudden death following full meals in persons of delicate health, and cases of sudden death from the same cause. I have said

17 The passions have a great influence upon the digestion of the food. It is invigorated by chearfulness - hence we feel least inconvenience from full meals which are followed by chearful conversation. ~~The passions have patients~~ It is retarded by grief - fear - and shame - The passions seem to act only upon the muscular fibres of

V Is there not a preternatural affinity of the Electroid fluid of the nerves to the stomach which fascilitates the fermentative process, & thus impairs the digestion? It seems probable from an exp[t] related by Dr Johnson. If the 8[th] pair of nerves which goes to the stomach be divided, digestion is immediately interrupted, & the food puts on the nature of feces in the stomach.

V Some of you will perceive a yeast. I have rejected fermentation from being one of the causes of the

of the Stomach. In the former case the Stomach is assisted in propelling the aliment after it is digested into the Pylorus; - in the latter case, the debility of the Stomach induced by the relaxing passions prevents its acting with its usual force in throwing the food out of the Stomach.

The Aliment when it is digested is called Chyme. After it passes into the Duodenum it is mixed with the bile. The cystic bile is said to precipitates its faecal parts from it, and imparts to them its peculiar Color. It is now called Chyle.

I have thus mentioned the means by which Chyle is formed by the Stomach, but it requires the aid of another viscus to render it fit for

V Of. certain excrementitious Matters

In Answer to the ~~these~~ first of these opinions,

from the blood: ~~[illegible]~~

I shall only say the on nature and in Answer to

theyney is not of acid ~~[illegible]~~

the second, I shall ~~[illegible]~~ now ~~[illegible]~~ lay before you

~~[illegible]~~

some facts intended to prove that the liver serves a

much higher purpose than to discharge ~~[illegible]~~

~~[illegible]~~ any thing of a fecal nature

from the blood. go to account of the
liver p: 16.

composing perfect animal nourish-
=ment. This viscus I believe to be the
Liver. The common opinion of the
Office of this large & noble viscus is
that it is intended [illegible] to furnish
a fluid which by mixing with the
[illegible] Chyme that descends from the
Stomach forms the Chyle. The Chyme
was supposed to be of an acid na-
=ture, and this acidity was said to
be destroyed by the bitterness of the bile.
This opinion was founded upon some
experiments made by Dr Ramsay of
Edin^{r} and was taught by Dr Cullen.
2 The Liver was supposed by some
Physiologists to be a large excretory
viscus intended to seperate & throw

Of the Lymphatics or Absorbing System.

Upon this Subject you are not to expect a minute detail of all the Opinions & controversies which are to be found in books. Such a detail would be as useless, as it would be tedious. I shall select only such facts as appear to be true, and deduce such principles only from them as admit of being applied to pathology & the practice of Physic. —

By the Absorbing System is meant the Lacteal as well as Lymphatic vessels. They are alike in so many particulars that they have been designated by one name. They both open into cavities of the body — they have the same structure. They, perhaps this Glands in some cases,

p: 654 before Lymphatics.

Of the Chyle

We return to pursue the Chyle which when formed in the manner that has been described by the stomach and liver is conveyed by certain vessels distributed plentifully through the mall, and sparingly thro' the large guts called Lacteals from the milky color of the chyle which passed through them. These Lacteals have been supposed to perform the office of Absorbents by some physiologists, while others suppose they perform the office of Secretory vessels, and that they induce by their action a change upon the Chyle analagous to that which a gland imparts to the

fluids which enter into them. The Chyle whether admitted into the Lacteals by absorption or secretion is conveyed by them into the Pancreatic Duct into a large Canal called the Thoracic Duct which runs along the vertebræ, and is poured from it into the left Subclavian Vein in which it is mixed with the blood, and conveyed to the heart. By what means it acquires all the properties of blood remains yet to be explained. Dr Hutchinson has thrown some light upon this mysterious subject in his ingenious inaugural dissertation. He has discovered by many experiments that the Chyle is coagulable in the thoracic duct, and after it enters the Arteries, but that

it posts off its coagulating quality in the veins. From this you see it appears one of the properties of the blood in the thoracic duct, and in the Arteries; but it is deficient in Veins. It throws up ——— marks of what is called ——— Vitality, or What I have called Animalization of the Coagulable lymph of the blood, when subjected to galvanic influence. The Doctor supposes further, that the blood like the bones and muscles possesses a power of converting the matters which are brought into contact with it into its own nature, and hence he says the cause of

Sanguification.

The fæces when precipitated from the Chyle pass slowly into the large guts. These are capacious, in order to prevent the ~~[illegible]~~ ~~[illegible]~~ inconveniencies of our frequently discharging them. In old age they stagnate for many days without much injury to the system: on the contrary, they probably perform the offices of those stimuli which have ceased to act, or have become feeble in old people, and thus help to keep up the actions and machinery of life.

The stagnation of the fæces in ~~[illegible]~~

✓ The Intestines of Carnivorous animals are much shorter in proportion to the length of their bodies than in granivorous ~~or~~ animals. ~~for [illegible] they are as [illegible] as they [illegible] the former & as [illegible]~~ and for obvious reasons. Vegetables afford their nourishment more slowly & ~~[illegible]~~ with more difficulty than animal matters, ~~hence~~ they require more mastication — longer digestion from one or more stomachs & a longer course of lacteals to absorb the chyle formed by vegetable food.

the bowels of old people ~~is supposed~~ seems to be in the
Colon, and hence the reason probably
why the wind discharged by them is
less offensive than in persons in
whom the faces are constantly lodged in
the Rectum.

We proceed next in order to speak
of that fluid which is formed from
the Chyle, and that is Blood.

~~40 th p. 559 1~~

seldom[20] offensive, as it is in childhood & middle life.

We should proceed next in order to

You will perceive ~~that~~ I have taken no notice of the Office of the Liver. It treat of the blood ~~lymphatics~~; but before we take leave of the ~~anatomy of the~~ functions of the viscera, there ~~is~~ remains one, upon the use of which Physiologists have been divided or silent since the ~~[illegible]~~ birth of our science. ~~I shall~~ I mean the Spleen. I shall attempt to explain its use by delivering ~~[illegible]~~ a few remarks upon it. Some of the Lymphatics ~~do not~~ it has been supposed pour their contents into the Thoracic Duct. ~~but~~ Dr Monroe ~~has~~ believes that this is the case ~~enter the blood vessels in other places. This~~ from the following experiment. ~~has been proved by Dr Monroe by a simple~~ expt. – he tied up the thoracic duct in several ~~[illegible]~~ animals, and fed them ~~of~~ upon madder wh. he found tinged their bones. ~~It has been~~ Several other facts favour this opinion ~~a fact related by further established by an experiment~~

Mr Richerand ~~[illegible]~~ applied a small quantity of ℥ Ointment to the right ~~leg~~ of a young man. Soon afterwards he observed the salivary glands ~~[illegible]~~. One half the ~~[illegible]~~ tongue on

& pass by them in others & they ~~[struck]~~ both have valves. — they differ chiefly in conveying ~~of~~ fluids of a different quality to the thoracic duct.

Having ~~[struck]~~ mentioned the uses of Lacteals formerly, ~~I~~ it remains only to speak of the Lymphatics ~~[struck]~~ They are system of small vessels originating ~~[struck]~~ from all the ~~[struck]~~ cavities of the body, which after frequently anastomosing, — enlarging & contracting ~~[struck]~~ thro a series of glands called Conglobate, & then discharge their contents into the ~~[struck]~~ thoracic Duct, which empty them into the ~~[struck]~~ mass of blood in the manner formerly mentioned.

The following circumstances deserve Attention with respect to these vessels.

1 They appear to possess Coats analagous

left side to be affected by it. The right side of the mouth & tongue were wholly unaffected by the ‡ These facts are important, as they shew that certain medicines may be introduced +

✓ The fibres of these Coats, moreover, possess great irritability, - insomuch that according to Dr Haller they disappear altogether when they are stimulated, even tho' they be filled with their natural, or with any artificial liquor. -

+ into the system without mixing with the blood, or entering the great circulation. It is thro' the lymphatics only that liquids pass to the kidneys from the stomach, and hence the rapidity of their passage. A Direct communication is not necessary for that purpose. -

‡ In the course of the year 1808 I attended a young Gent. who had salivated himself in twice for the V Disease. The Spitting &c

to the coats of the bloodvessels, One of which
is ~~not said to be~~ evidently muscular. this appears
1 from their Alternate dilatation & contraction,
and 2ly from their being liable to pain -
~~&~~ swelling & inflammation. These coats are
much stronger in proportion to their size than the
coats of the blood vessels. ✓

2 They are all endowed with Valves placed
in some cases at a small, in Others at
a large distance from each Other, which
prevent the reflux of the lymph, in the
same manner ~~as~~ that the Valves in the Veins
prevent the reflux of the blood.

3 They are all endowed, not only with
nerves, but with Arteries & Veins in which
the circulation is carried on with the
same regularity in the largest vessels of
the body.

4 ~~from the analogy of the~~ It has ~~the matter of~~ with ~~certain~~ ~~Lintials~~ it has animals
been supposed that they are all endowed with

O soreness were on One side of his mouth only - and the sores were healed on ~~one side~~ that side only of his penis by the application of ☿ to them. #
+ matters Until they have first been dissolved by a liquor ~~first~~ secreted by the Arteries.

In Decr 1811 I ~~attended~~ visited in consultation a gentleman from New Jersey, Judge Bergen in a palsy, who had been salivated by his physician, and in this case the ☿ affected the paralytic side of his mouth only. ~~I shall en-deavour presently to give a different explanation of these facts in our pathology.~~ — A

√6 They are said to possess a retrograde power - by which means their contents are propelled in a contrary direction to that which is natural. ~~[illegible]~~ Dr Darwin ~~has~~ has furnished many facts in favor of this retrograde motion in these vessels. & his father has explained many of the phenomena of diseases from it. see their works.

† ~~they pervade~~ Mr Richerand has lately mentioned a fact which shews that the lymphatics ~~[illegible]~~ convey matters to remote parts of the body, ~~without~~ without

an opening which has been called a
<u>mouth</u> with which they not only absorb
liquids, but feed as it were upon solid
matters: such as ~~the~~ blood - flesh, &
even bone. what makes it still more probable:
they possess something like mouths, is that they have
been demonstrated in several fish. [Dr
Monro supposes the Lymphatics do not absorb these]
5 The Lymphatic glands appear from
filling them with . ☿ to be cellular, but
Dr Monro has demonstrated that they are
composed ~~convoluted~~ of convoluted vessels. Mr Hewson
however thinks he discovered, a cellular
structure in some of the smallest glands.
It is certain that the blood vessels - nerves
& the small cells of the smallest glands are
connected together by cellular membrane.

Having delivered these general Obser-
-vations, we proceed next to inquire in
what manner the Lymph which is carried

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A Upon Dr Moore's expt & the facts I have related I shall only remark that I believe that the colouring matter of the madder penetrated thro the solids matter of the stomach in Dr Moore's expt and thus found its way into the general circulation by which it was conveyed to the bones. The same thing probably took place in the expt of Mr Howe upon a rabbit in which he tied up the thoracic duct just before it enters at the junction between the left jugular & subclavian Veins, and afterwards injected ℥i of strong Infusion of Rhubarb, in 3/4 of an hour, the Urine was voided, & the presence of Rhubarb was detected in it by the addition of potash to it. It passed into the gall bladder in Mr Howe's 2nd experiment in a dog in the same way. nothing can be

inferred in favor of Dr Monroe's Opinion from ye Asserting ~~but one~~ the Lymphatic

~~this comes me my dear account informing~~

Glands of One side only. I hope in our pa-thology to give a more satisfactory explan^n ~~solution~~ of these facts. I w^d only remark further,

~~you notion that I send to you a copy~~ ~~[illegible]~~ fore-

that I do not think that we require a passage from the Stomach to the Kidneys to account from the sudden rapid encrease of Urine after the Stomach has been overcharged with an watery liquors. It may be explained in ...n upon another principle to be mentioned hereafter.

the intervention of the Thoracic duct. By
applying Mercurial Ointment to the leg, of a
young man, he affected the salivary glands
of the left side only, and one half of the
tongue of the left side with those usual sores
which attend a salivation — the right
side was wholly unaffected with the Ψ.

by these ~~[illegible]~~ vessels to the heart is formed in the different cavities of the body. Formerly it was supposed to be an exudation from the extremities of the arteries, but Mr Hewson has made it probable opinion that it is a secreted liquor. This he endeavours to establish 1: by proving that the lymph is of a coagulable nature, & that it partakes of most of the properties of the coagulable lymph of the blood. This coagulable quality belongs equally to the fluid which is found in the lymphatic vessels with that which is found in the cavities of the body. 2 He infers it from the diseases to which this fluid is liable, all which he ascribes to the disordered state of the ~~[illegible]~~ vessels which secrete it. E.g: In a Dropsy the

Lymph is less coagulable than in health. this he ascribes to a relaxation in the secretory vessels. Again. we sometimes find certain internal surfaces as the pleura Trachea Pericardium & even the inside of the heart covered with a crust which resembles the size or buffy coat of the blood. this Mr Hewson supposes to be produced by too much tone or action in the vessels which secrete the Lymph - & lastly - he supposes Pus to be nothing but the product of a certain degree of inflammation in these vessels. - this opinion concerning pus was first suggested by my predecessor in this Chair Dr Morgan, and it is now I find adopted by many physiological writers.

In what manner is the Lymph when secreted taken up by the Lymphatics?

It has commonly been supposed by means of capillary attraction - hence their name of Absorbents - but I would rather suppose that it is by the effect of muscular contraction excited by the specific stimulus of the Lymph or matter taken up, upon the mouths of the Lymphatics. —

In what manner is the Lymph when it enters the lymphatics conveyed to the thoracic duct and throughout the body? I answer - 1 by the pulsation of adjoining Arteries - 2 by the pressure of contiguous muscles - and 3 by the stimulus of the Lymph acting specifically & mechanically upon the lymphatic vessels in every part of their course.

Are Lymphatic vessels found in every part of the body? I answer in every part except the head, and there

V 3ly From the cures which have been made of the Hydrocephalus internus, which dissections prove to arise from an effusion of water in the Ventricles of the brain. — ff

66 from the following cir-
existence there is presumed 1 from the
-cumstances.
analogy in certain fishes particularly
the Skate in whose head Dr Monroe dis-
-covered them many years ago 2dly from
the history of a
~~the nature of~~ disease related by Mr Hewson.
A man was affected with a slight
with
palsy of his left arm - ~~and~~ a hesitation
his
in ~~the~~ voice & a trembling of his lips. These
Symptoms were supposed to arise from
some compression in the brain. A Swel-
-ling in a lymphatic gland in the left
side of the neck which finally suppurated,
the
& ~~removed~~ all his complaints - Probably
an effusion from
by the translation of ~~an internal~~
or cephalic
an internal to an external gland,
3dly It is presumed from the certainty
that the veins in no part of the body

absorb Lymph. This has been proved by many experiments made by Monro & Hunter.

I have said that the lymphatics absorb solid as well as fluid bodies. This is evident from many facts. The destruction or annihilation of the thymus gland can be accounted for in no other way. The greater laxity of the bones of old than of young ones, - the absorption of the color imparted to the bones by madder, - the preternatural softness of the bones in certain diseases, - & the detection of bony matter in the Urine, all prove that the lymphatics possess a power over solid matters. - To these we may add the occasional disappearance of schirrous

✓ It would seem from this fact, that the Arteries & Lymphatics perform the opposite offices in the System. The business of the One, is to repair, - of the Other to destroy different parts of the ~~system~~ body - of the One to secrete ~~or effuse~~ & effuse a fluid, & of the Other, to absorb it & mix it again with the blood from which it was secreted. Health seems to consists in this Strife between the Sanguiferous & Lymphatic Systems, and no sooner ~~[illegible]~~ does an armistice take place between them ~~[illegible]~~ - than we behold ~~in~~ Dropsy - Diabetes - Rickets - and Scrophula - of wh ch more hereafter.

tumors & worms in every part of the body. They appear to be removed only in consequence of the action of the lymphatics upon them.

Mr Hunter has remarked that in infancy the cavity of the thigh bone is remarkably small. As the child advances in age this cavity becomes larger - Thus while the Arteries add bony matter to the external the Lymphatics consume & absorb the internal part of the bone. In this manner - it is probable the solids are constantly undergoing a renovation in a greater or less degree, more especially in the early part of life.

But we have not yet done with the Offices of the Lymphatics. They

I have said ~~Absorption takes place~~ the Lymphatics ~~absorbs~~ from internal parts of the body, but it has long been believed that they absorb likewise from the Surface of the body, and ~~many practical~~ many practical inductions in pathology and the practice of physic have been made from it. =